

Invitation to Participate

LED Lighting

2013 Appliance Efficiency Rulemaking
California Energy Commission

May 30, 2013

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Purpose of Workshop

- ❑ The Commission is gathering information to determine how to proceed with LED lamps listed in Phase 1 of the OIR.
- ❑ ITP is the opportunity to provide information, data, and proposal to help develop the standards for LED lamps.
- ❑ During this session, we will discuss the information and data received from the stakeholder related to LED lighting products
- ❑ Staff will discuss the next steps and will discuss questions and concerns on how to submit proposal.



Sub-Agenda

- ❑ Purpose
- ❑ Results
 - ❑ Responses received
 - ❑ Scope
 - ❑ Installed base and shipments
 - ❑ Modes of Operation
 - ❑ Duty Cycle
 - ❑ Power Management
 - ❑ Energy Consumption
 - ❑ Lifetime
 - ❑ Incremental cost of efficiency
- ❑ Next Steps



Information Requested

- ❑ Product Definition & Scope
- ❑ Existing Test Procedures
 - ❑ Across all modes
- ❑ Sources of Test Data
- ❑ Existing Standards & Standards in Development
- ❑ Product Lifetime
- ❑ Product Development Trends
 - ❑ Redesign Cycle
- ❑ Operations & Modes
- ❑ Energy-Saving Technologies & Features
- ❑ Costs
- ❑ Hardware
- ❑ Market Characteristics
- ❑ Market Competition



Responses

Investor Owned Utilities (IOUs)

National Electrical Manufacturers Association (NEMA)

Natural Resources defense Fund (NRDC)

Switch Lighting

SORAA Lighting

Universal Lighting Technologies



Information Requested

- ❑ Product Definition & Scope
- ❑ Test Procedures
- ❑ Sales and Stock Information and Test Data
- ❑ Existing Standards & Standards in Development
- ❑ Product Design Life and Duty Cycle
- ❑ Product costs and Incremental Cost for efficient Products
- ❑ Energy Savings/Unit and Baseline Energy Consumption
- ❑ Peak Demand Energy Use
- ❑ Market Strategy
- ❑ Consumer Benefits and Impact on the States Economy



Scope

The ITP responses to the LED lamps focused on LED general service and reflector screw-base lamps, similar to those the incandescent variants that are currently regulated.



Sales and Stock

IOUs submitted data that states the following (national):

General Service Lamps:

4.39 Billion general service lamps

69.2% incandescent, 0.6% halogen 29.6% CFL, 0.5% LED

Reflector Lamps:

0.83 Billion reflector lamps

55% incandescent, 23% Halogen, 19% CFL, 3% LED

Discussion: IOU ITP response uses 2010 information. What impacts has EISA had on the marketshares above?

Are LED lamps likely to displace both incandescent lamps and CFLs in the market?



CRI of LEDs

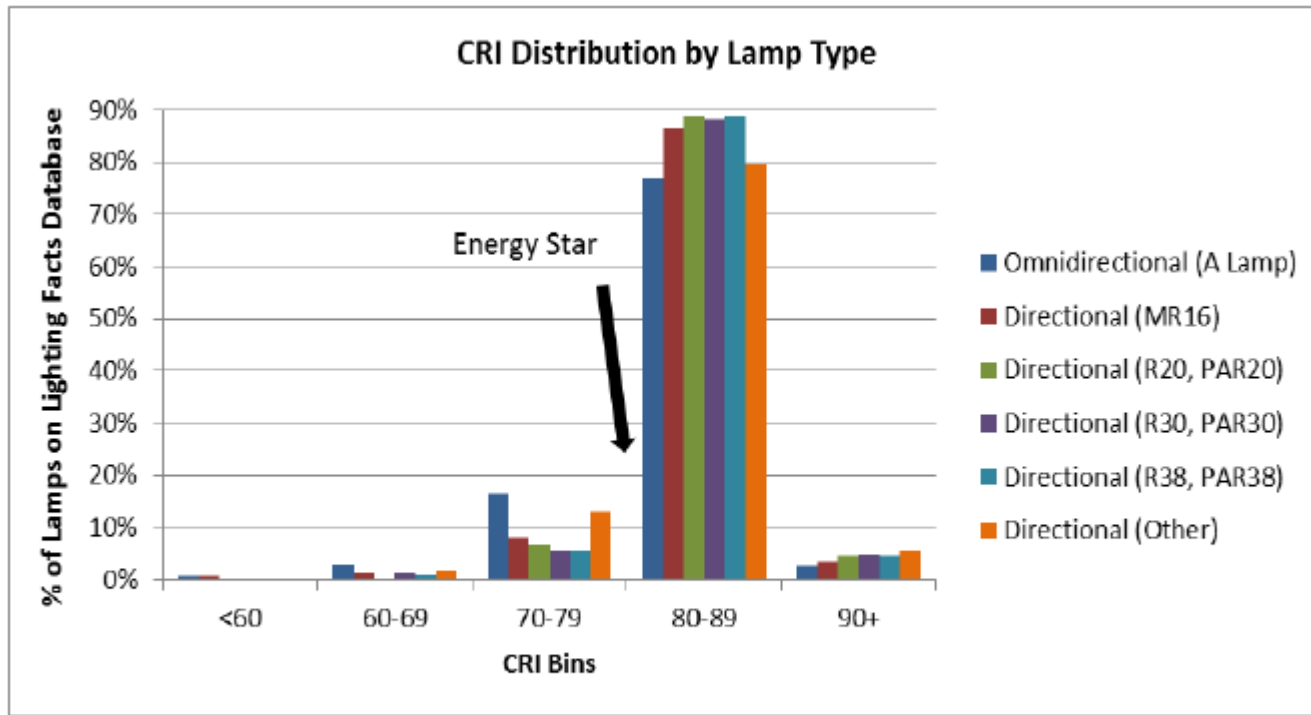


Figure 9 Distribution of Replacement Lamps across CRI (R_a) Bins, by Lamp Type



CRI of LEDs

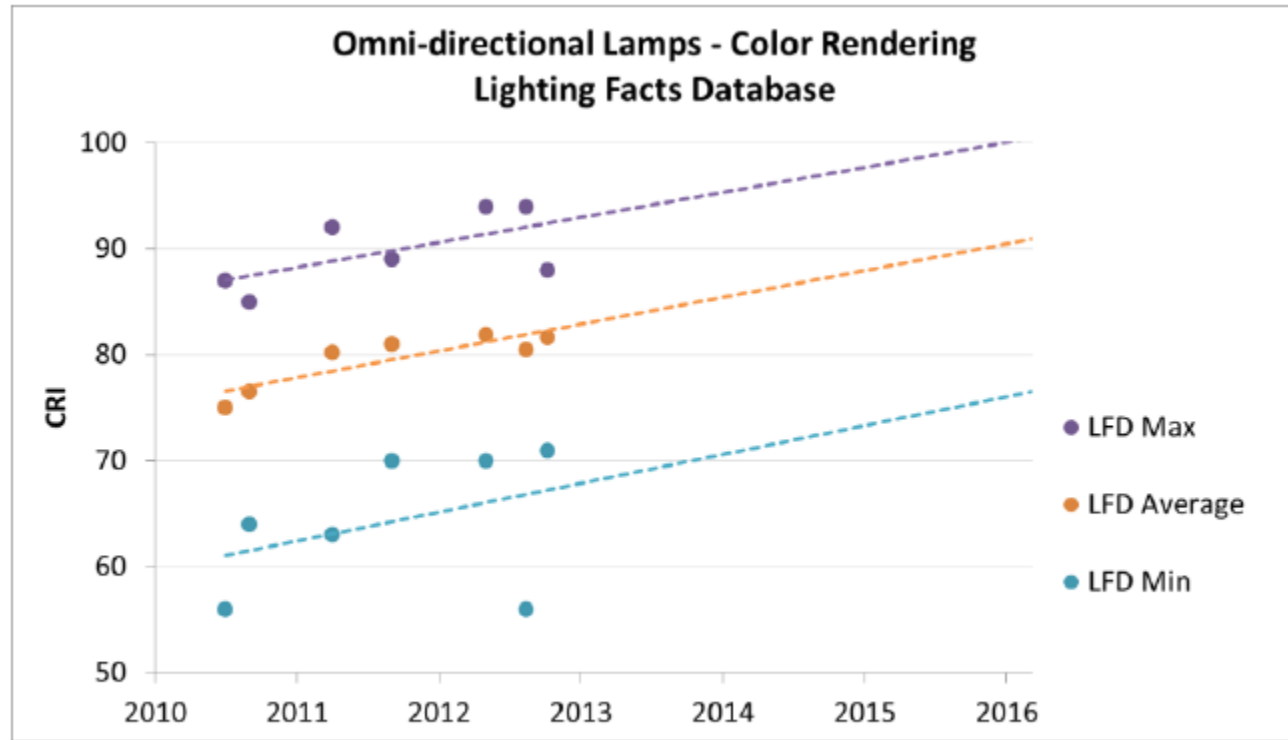


Figure 12 Omni-directional LED Lamp CRI trends from 2010 through 2012



CRI of LEDs

IOU's analysis of LED lamp CRI shows there are centered in the 80's. With, at least for omni-directional lamps, overall upward trends for CRI.

Discussion: What are the market pressures driving CRI upwards?

Directional lamps seem to be far more stagnant in CRI improvements. What is different about market pressures in this market?

Some responses suggest trading lumens for CRI, which is a larger driver of customer satisfaction?



Design Life and Duty Cycle

IOUs submitted estimated lifetime of approximately 35,000 hours and also notes that 5 year warranties are commonly available.

ENERGY STAR requires 3 year warranties

NRDC cites 25,000 hours as a common life, and suggested perhaps 10,000 hour lamps may become more popular due to potential lower costs.

Discussion: To what extent do ENERGY STAR, and CA LED specification lamps have a different lifetime from general LEDs?

Will the rated lifetime drop to lower LED first cost? Would this lead to higher or lower lifecycle cost?



LED Cost

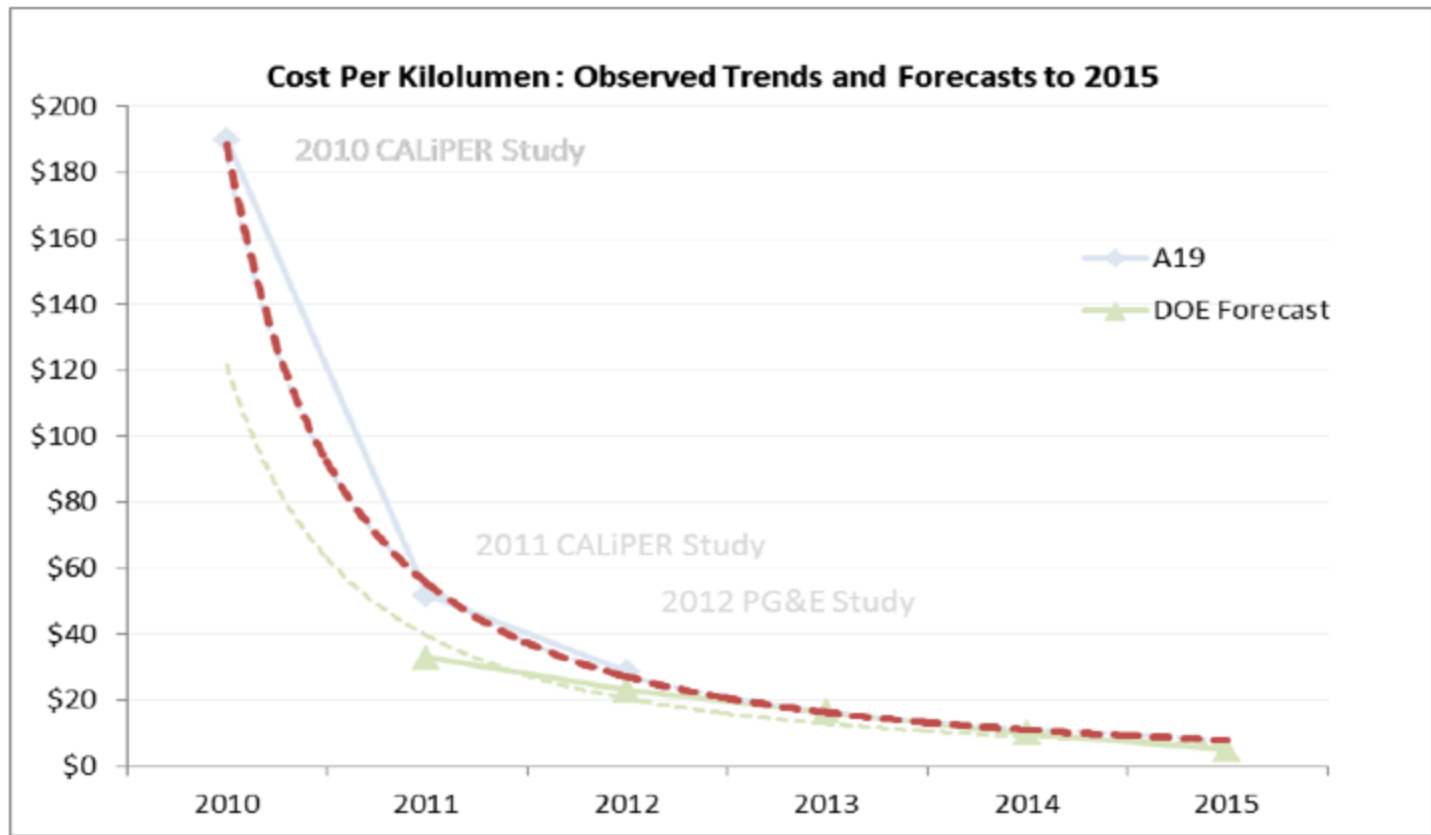


Figure 4 Projected Price per Kilolumen for LED Replacement Lamps



LED Cost

IOUs presented several projections all showing large decreases in the prices of LED lamps.

Discussion: Do these cost projections for LEDs expect static quality aspects such as warrantee, quality, energy efficiency?

Are LED prices approaching a “plateau” as shown in the projections?



LED Efficacy

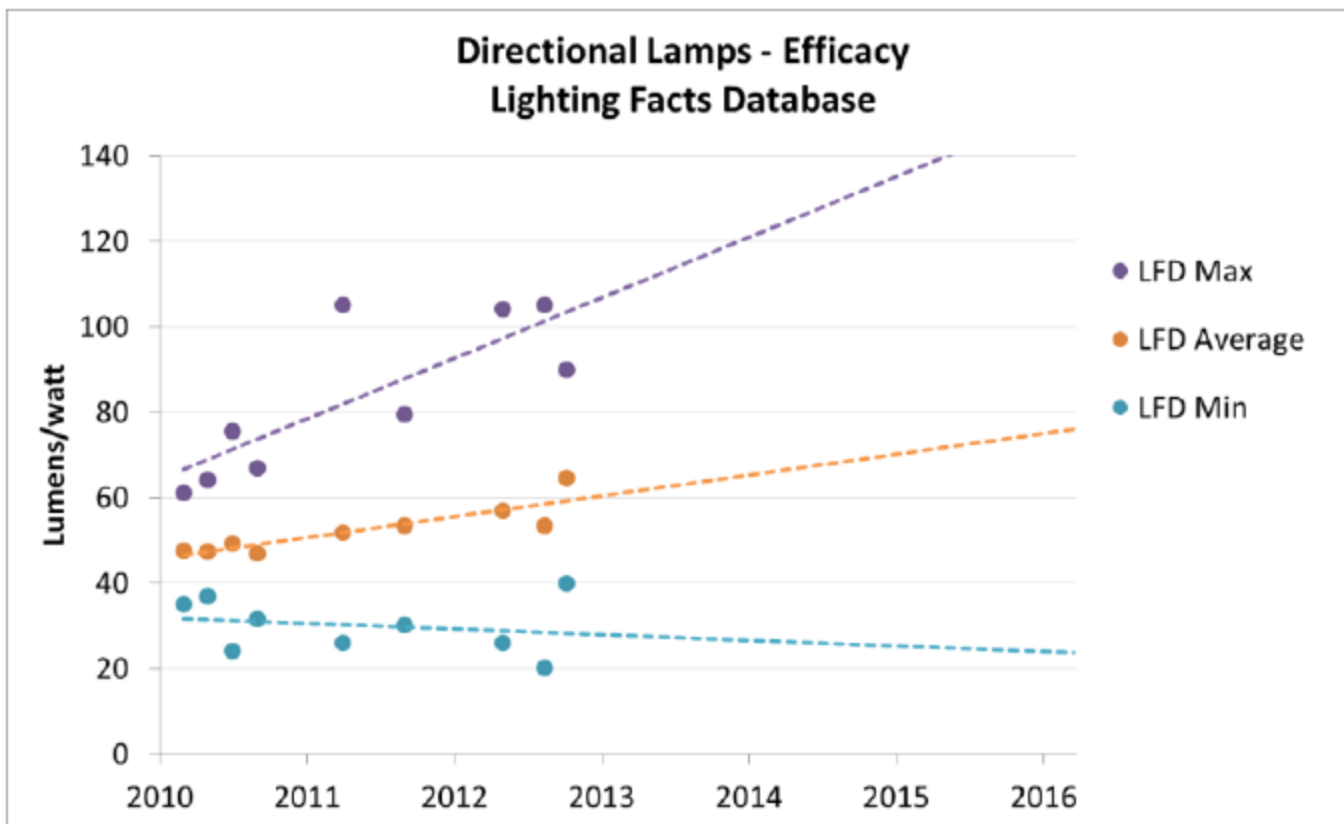


Figure 16 Directional LED Lamp Efficacy trends from 2010 through 2012



LED Efficacy

IOU analysis shows increasing divergence in the efficacy of LED lamps. For directional lamps, the analysis predicts that efficiency is actually getting worse in the bottom of the market, with some products using 5 times the energy to produce a lumen.

Discussion: What is causing this large spread in efficacy?

Are there LED reflector lamps that approach incandescent efficacy?

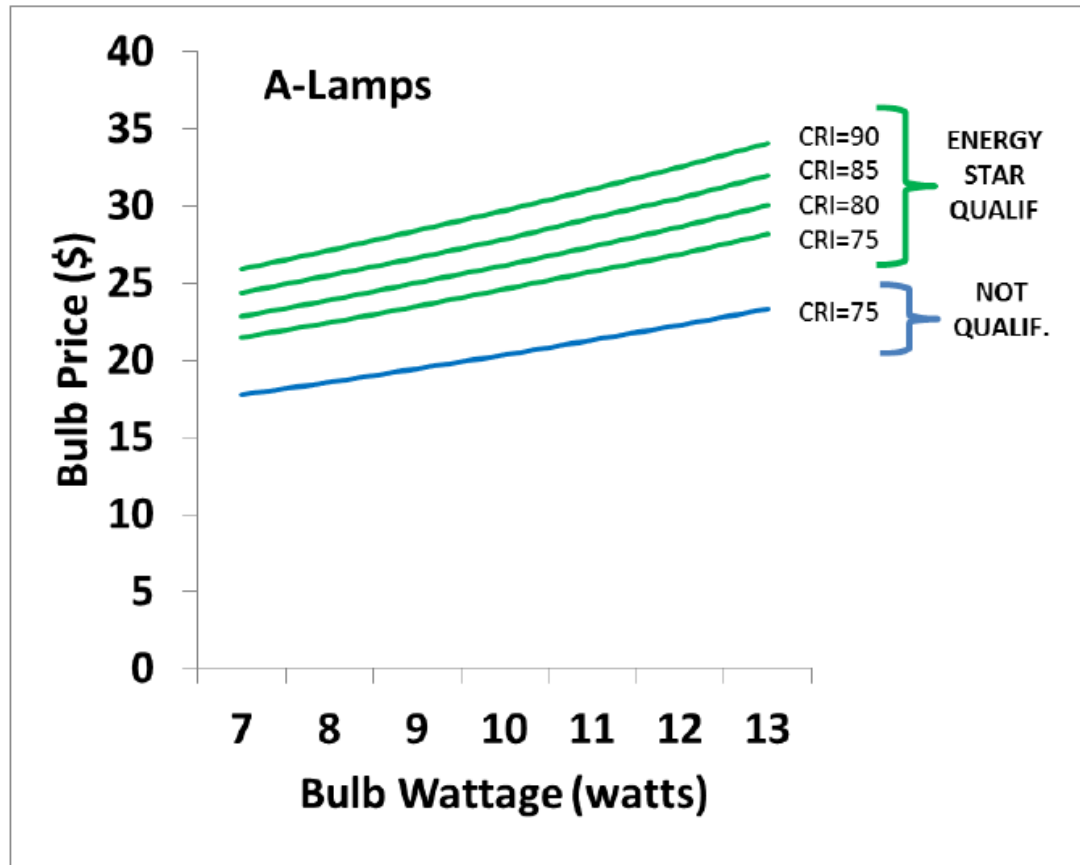


CRI and Cost

Color Rendering	Normative Lm/W	Normative Lamp Cost (Lm/\$)
CRI 80/ R9 20	100%	100%
CRI 80/ R9 20	120%	150%
CRI 90 / R9 50	100%	150%
CRI 90 / R9 50	80%	110%



CRI and Cost



CRI and Cost

Responses to the ITP indicate significant increase in cost for CRI.

Discussion:

As the price of LEDs generally continue to decrease, will the incremental cost for improved CRI decrease as well? Will that reduce the incentive for manufacturers to balance CRI costs with decreased efficacy?

Should the incremental costs of improved CRI be evaluated as a life-cycle cost rather than a first cost due to associated decreases in energy efficiency?



General Comment

Any other topics that stakeholders wish to discuss (if time allows)?



Next Steps

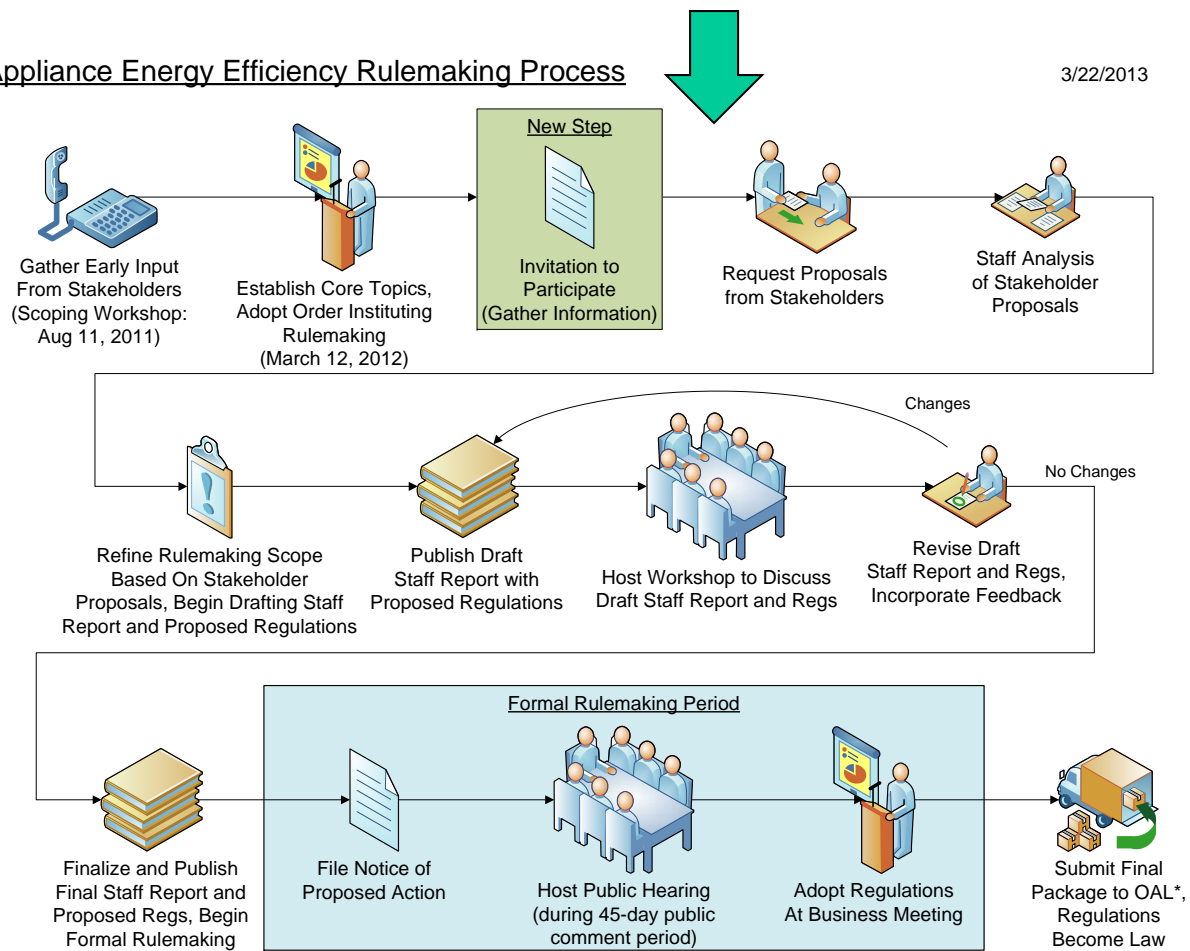
- ❑ Following the ITP workshops, the Commission will request proposals for new/updated efficiency standards or measures.
- ❑ Interested parties may submit proposals from **June 10 to July 25, 2013.**
- ❑ Proposal Template and Guidance is forthcoming.
- ❑ Proposals should be based on the information received through the ITP.
- ❑ Commission staff are available to discuss questions and concerns at anytime during the proceeding.



Public Participation

Appliance Energy Efficiency Rulemaking Process

3/22/2013



*Office of Administrative Law



Discussion & Comments

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LED Lamps Docket #12-AAER-2B

at [docket@energy.ca.gov](https://docket.energy.ca.gov)

